

PATENT COOPERATION TREATY

PCT
NOTIFICATION OF ELECTION
 (PCT Rule 61.2)

Date of mailing (day/month/year) 27 October 2000 (27.10.00)		To: Commissioner US Department of Commerce United States Patent and Trademark Office, PCT 2011 South Clark Place Room 524 Arlington, VA 22202 ETATS-UNIS D'AMERIQUE ETATS-UNIS D'AMERIQUE in its capacity as elected Office
International application No. PCT/EP00/01065	Applicant's or agent's file reference P 53035	
International filing date (day/month/year) 10 February 2000 (10.02.00)	Priority date (day/month/year) 16 March 1999 (16.03.99)	
Applicant VOGT, Christian et al		

1. The designated Office is hereby notified of its election made:

in the demand filed with the International Preliminary Examining Authority on:

04 October 2000 (04.10.00)

in a notice effecting later election filed with the International Bureau on:

2. The election was

was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer S. Mafla Telephone No.: (41-22) 338.83.38
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PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference P 53035	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/EP 00/ 01065	International filing date (day/month/year) 10/02/2000	(Earliest) Priority Date (day/month/year) 16/03/1999
Applicant W.R. GRACE & CO.-CONN.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.

It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

a. With regard to the language, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international search was carried out on the basis of the sequence listing :

contained in the international application in written form.

filed together with the international application in computer readable form.

furnished subsequently to this Authority in written form.

furnished subsequently to this Authority in computer readable form.

the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. Certain claims were found unsearchable (See Box I).

3. Unity of invention is lacking (see Box II).

4. With regard to the title,

the text is approved as submitted by the applicant.

the text has been established by this Authority to read as follows:

5. With regard to the abstract,

the text is approved as submitted by the applicant.

the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the drawings to be published with the abstract is Figure No.

as suggested by the applicant.

because the applicant failed to suggest a figure.

because this figure better characterizes the invention.

None of the figures.

INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP 00/01065A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 C09D167/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 C09D C08L B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 40 10 167 A (BASF LACKE & FARBEN) 2 October 1991 (1991-10-02) page 2, paragraphs 1,2; claims 1,2,10,11 page 3, line 36 - line 51 page 3, line 59 - line 67 page 4, line 46 - line 49 page 5, paragraphs 1,3-5 examples 2,24 ---	1-3,5, 7-16
X	GB 964 440 A (SCHENECTADY CHEMICALS INC.) page 1, column 1, paragraph 3; claim 10 page 1, column 2, line 62 - line 70 page 2, column 2, paragraph 1 examples 7-14 --- -/-	1,10,14, 15

 Further documents are listed in the continuation of box C. Patent family members are listed in annex.

° Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the International filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the International filing date but later than the priority date claimed

"T" later document published after the International filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the International search

Date of mailing of the International search report

9 May 2000

19/05/2000

Name and mailing address of the ISA
European Patent Office, P.B. 5818 Patenttaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Lauteschlaeger, S

INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP 00/01065

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 22 28 288 A (STOLLACK AG) 28 December 1972 (1972-12-28) example 5 page 2, paragraphs 1,2 -----	1,10,14, 15
X	GB 349 464 A (IMPERIAL CHEMICAL INDUSTRIES LIMITED) claim 2; examples 1-3 -----	1,9,16
X	GB 1 119 091 A (SCHEECTADY CHEMICALS INC.) page 1, column 1, paragraph 2; claim 1 page 2, column 1, paragraphs 2,4-6 -----	1,5-7,10
X	GB 836 004 A (SCHEECTADY VARNISH COMP.) page 2, column 1, paragraphs 3,4; claims 7,12,32 -----	1,10

INTERNATIONAL SEARCH REPORT

Information on patent family members

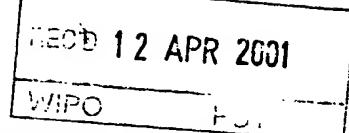
International Application No

PCT/EP 00/01065

Patent document cited in search report	Publication date	Patent family member(s)			Publication date
DE 4010167	A 02-10-1991	NONE			
GB 964440	A	NONE			
DE 2228288	A 28-12-1972	AT	313436 B	15-01-1974	
		DD	97438 A	05-05-1973	
		IT	956442 B	10-10-1973	
GB 349464	A	NONE			
GB 1119091	A	BE	628506 A		
		DE	1239045 B		
		FR	89538 E		
		FR	1339547 A	13-01-1964	
		GB	978717 A		
		US	3211585 A	12-10-1965	
		US	3249578 A	03-05-1966	
		US	3342780 A	19-09-1967	
GB 836004	A	NONE			

PATENT COOPERATION TREATY

PCT



INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

14

Applicant's or agent's file reference P 53035	FOR FURTHER ACTION		See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/EP00/01065	International filing date (day/month/year) 10/02/2000	Priority date (day/month/year) 16/03/1999	
International Patent Classification (IPC) or national classification and IPC C09D167/00			
Applicant W.R. GRACE & CO.-CONN.			

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 6 sheets, including this cover sheet.

This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of sheets.

3. This report contains indications relating to the following items:

- I Basis of the report
- II Priority
- III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV Lack of unity of invention
- V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI Certain documents cited
- VII Certain defects in the international application
- VIII Certain observations on the international application

Date of submission of the demand 04/10/2000	Date of completion of this report 10.04.2001
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Lauteschlaeger, S Telephone No. +49 89 2399 8303



**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/EP00/01065

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, pages:

1-6 as originally filed

Claims, No.:

1-16 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- the language of publication of the international application (under Rule 48.3(b)).
- the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- contained in the international application in written form.
- filed together with the international application in computer readable form.
- furnished subsequently to this Authority in written form.
- furnished subsequently to this Authority in computer readable form.
- The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- the description, pages:
- the claims, Nos.:
- the drawings, sheets:

5. This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/EP00/01065

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims 4
	No: Claims 1-3, 5-16
Inventive step (IS)	Yes: Claims
	No: Claims 1-16
Industrial applicability (IA)	Yes: Claims 1-16
	No: Claims

2. Citations and explanations
see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/EP00/01065

VIII.

- 1.1. It is noted that the use the coating is intended to be employed for ("for metal", "capable of being formed into a container") does not represent a meaningful limiting feature, since it cannot be verified on the basis of the composition as such; every coating composition can be coated on a metal and can be formed into a container (depending on the method employed and more or less successfully).
- 1.2. The designation "substantially free of" renders the scope of claim 1 unclear and should thus be replaced by the definition given on page 3, first full paragraph of the present description.

V.

In the Report the following documents are referred to:

D1 = DE 4010167

D2 = GB 964440

D3 = DE 2228288

D4 = GB 349464

D5 = GB 1119091

D6 = GB 836004

1. Novelty

- 1.1. It is noted that the present claim wording of the independent claims (claims 1, 10, 14, 15) does not contain a limitation to a particular resol resin; components b) are only said to "comprise a condensation product made from a phenol or homologue thereof and formaldehyde". Only according to dependent claims 5 and 6 particular phenol homologues are specified (in addition to phenol as such). It is noted in this context, that claim 6 contains an obvious error: Line 2 of claim 6 should read "comprises.... or (instead of "and")(in accordance with page 3, line 25); otherwise the option " or a mixture thereof" would make no sense.
- 1.2. Coating compositions for metals comprising components a) - c) in the proportions as claimed are disclosed in documents D1 - D6 (cf. passages specified in detail in the Search Report). The afore-mentioned compositions neither contain PVC nor diglycidyl ether compounds.

Claim 1 of D1 unambiguously discloses coating compositions free of epoxy-groups (proportion of epoxide resin = 0!) whose proportions of polyester and phenol resin broadly overlap with the amounts as presently claimed.

It is noted that a document's disclosure is not limited to the examples.

Moreover, it is noted that the presently claimed proportions of components a) - c) relate to compositions consisting of exclusively a) and b) as solids; according to the wording of present claim 1, however, further components (also acrylate resins) may be added in any proportion. The proportions of a) and b) as disclosed in examples 2 and 24 of D1 correspond to the proportions of a) and b) as presently claimed calculated exclusively on the basis of components a), b) and c) as claimed.

It is, furthermore, noted that phenol resins which are condensation products of bisphenol A with formaldehyde (= resol) are expressis verbis mentioned on page 3, lines 62, 63 of D1.

The compositions disclosed in D1 (cf. page 5, paragraph 3 and examples) additionally contain a lubricant such as e.g. a polyolefine wax.

As a consequence of the aforesaid independant claims 1, 10, 14 and 15 and most of the subclaims thereof are anticipated by the disclosure of the afore-mentioned documents (cf. details in the Search Report).

As to D2 cf. also point 1.1. above.

As to D3, the subject-matter of the independant claims is exclusively anticipated by example 5; as to D4, example 3 destroys novelty of claim 1.

As to D5 and D6, it is noted that European Case Law is not applicable during the PCT phase of the application. Moreover, it is noted that the decision T198/84 (of a Technical Board of Appeal of the EPO) relates to the selection of a range of numbers; selection from one list of components, however, does (according to European Case Law) not represent a novel selection.

D6, claim 7 (claim 12) unambiguously discloses an embodiment containing a resol in the amount as claimed. It is, furthermore, noted that cresol is a phenol also recommended according to the present application (cf. claim 5).

2.2. Inventive Step

If the Applicant succeeds in submitting a set of claims which relates to novel subject-matter, the question of inventive step will arise:

Document D1 (claims 1, 2 with proportion of (D) = 0, examples 2 and 24) is

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/EP00/01065

considered as the closest prior art since it equally concerns PVC-free can coating compositions. In the afore-mentioned claims and examples embodiments of can coating compositions free of PVC and BADGE are disclosed (D) = 0). The latter, epoxide-free embodiment is considered as the closest prior art.

Polyester components a) equally contain crosslinking constituents (trimellitic acid according to the examples and/or trimethylolpropane and/or neopentylglycol (cf. D1, page 3, lines 45 - 50).

In order to establish an inventive step the Applicant should submit convincing evidence that a technical problem has been solved in an unexpected manner by the feature(s) distinguishing the claimed compositions in view of the closest prior art.

It is noted that compositions containing components a) - c) in which a) contains two different types of crosslinking polyols are known to be suitable as coating compositions for metals (cf. D6, claim 32).

In order to permit proper assessment of inventive step and workability of the examples, the Applicant is invited to specify the chemical composition of the commercial product PHENODUR PR 401 employed according to the worked examples.

PCT

REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only

International Application No.

International Filing Date

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference
(if desired) (12 characters maximum)

P 53035

Box No. I TITLE OF INVENTION
BADGE-FREE CAN COATING

Box No. II APPLICANT

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

W.R. Grace & Co.-Conn.

1114 Avenue of the Americas
New York, N.Y. 10036
US

This person is also inventor.

Telephone No.

Facsimile No.

Teleprinter No.

State (that is, country) of nationality:

US

State (that is, country) of residence:

US

This person is applicant for the purposes of:

all designated States

all designated States except the United States of America

the United States of America only

the States indicated in the Supplemental Box

Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

Vogt, Christian
Bissenmoorweg 35

24576 Bad Bramstedt
DE

This person is:

applicant only

applicant and inventor

inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

DE

State (that is, country) of residence:

DE

This person is applicant for the purposes of:

all designated States

all designated States except the United States of America

the United States of America only

the States indicated in the Supplemental Box

Further applicants and/or (further) inventors are indicated on a continuation sheet.

Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:

agent

common representative

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)

Janssen, Bernd
UEXKÜLL & STOLBERG
Beselerstr. 4
D-22607 Hamburg
DE

Telephone No.

040-899 6540

Facsimile No.

040-89965488

Teleprinter No.

Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

Continuation of Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

If none of the following sub-boxes is used, this sheet should not be included in the request.

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

Ambrosi, Peter
Sandweg 13
24620 Husberg
DE

This person is:

applicant only
 applicant and inventor
 inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

DE

State (that is, country) of residence:

DE

This person is applicant for the purposes of:

 all designated States all designated States except the United States of America the United States of America only the States indicated in the Supplemental Box

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

This person is:

applicant only
 applicant and inventor
 inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

State (that is, country) of residence:

This person is applicant for the purposes of:

 all designated States all designated States except the United States of America the United States of America only the States indicated in the Supplemental Box

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

This person is:

applicant only
 applicant and inventor
 inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

State (that is, country) of residence:

This person is applicant for the purposes of:

 all designated States all designated States except the United States of America the United States of America only the States indicated in the Supplemental Box

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

This person is:

applicant only
 applicant and inventor
 inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

State (that is, country) of residence:

This person is applicant for the purposes of:

 all designated States all designated States except the United States of America the United States of America only the States indicated in the Supplemental Box Further applicants and/or (further) inventors are indicated on another continuation sheet.

Supplemental Box*If the Supplemental Box is not used, this sheet should not be included in the request.*

1. *If, in any of the Boxes, the space is insufficient to furnish all the information: in such case, write "Continuation of Box No. ... " [indicate the number of the Box] and furnish the information in the same manner as required according to the captions of the Box in which the space was insufficient, in particular:*

- (i) *if more than two persons are involved as applicants and/or inventors and no "continuation sheet" is available: in such case, write "Continuation of Box No. III" and indicate for each additional person the same type of information as required in Box No. III. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below;*
- (ii) *if, in Box No. II or in any of the sub-boxes of Box No. III, the indication "the States indicated in the Supplemental Box" is checked: in such case, write "Continuation of Box No. II" or "Continuation of Box No. III" or "Continuation of Boxes No. II and No. III" (as the case may be), indicate the name of the applicant(s) involved and, next to (each) such name, the State(s) (and/or, where applicable, ARIPO, Eurasian, European or OAPI patent) for the purposes of which the named person is applicant;*
- (iii) *if, in Box No. II or in any of the sub-boxes of Box No. III, the inventor or the inventor/applicant is not inventor for the purposes of all designated States or for the purposes of the United States of America: in such case, write "Continuation of Box No. II" or "Continuation of Box No. III" or "Continuation of Boxes No. II and No. III" (as the case may be), indicate the name of the inventor(s) and, next to (each) such name, the State(s) (and/or, where applicable, ARIPO, Eurasian, European or OAPI patent) for the purposes of which the named person is inventor;*
- (iv) *if, in addition to the agent(s) indicated in Box No. IV, there are further agents: in such case, write "Continuation of Box No. IV" and indicate for each further agent the same type of information as required in Box No. IV;*
- (v) *if, in Box No. V, the name of any State (or OAPI) is accompanied by the indication "patent of addition," or "certificate of addition," or if, in Box No. V, the name of the United States of America is accompanied by an indication "continuation" or "continuation-in-part": in such case, write "Continuation of Box No. V" and the name of each State involved (or OAPI), and after the name of each such State (or OAPI), the number of the parent title or parent application and the date of grant of the parent title or filing of the parent application;*
- (vi) *if, in Box No. VI, there are more than three earlier applications whose priority is claimed: in such case, write "Continuation of Box No. VI" and indicate for each additional earlier application the same type of information as required in Box No. VI;*
- (vii) *if, in Box No. VI, the earlier application is an ARIPO application: in such case, write "Continuation of Box No. VI", specify the number of the item corresponding to that earlier application and indicate at least one country party to the Paris Convention for the Protection of Industrial Property for which that earlier application was filed.*

2. *If, with regard to the precautionary designation statement contained in Box No. V, the applicant wishes to exclude any State(s) from the scope of that statement: in such case, write "Designation(s) excluded from precautionary designation statement" and indicate the name or two-letter code of each State so excluded.*

3. *If the applicant claims, in respect of any designated Office, the benefits of provisions of the national law concerning non-prejudicial disclosures or exceptions to lack of novelty: in such case, write "Statement concerning non-prejudicial disclosures or exceptions to lack of novelty" and furnish that statement below.*

Continuation of Box No. IV

Additional Agents:

Suchantke, Jürgen
 Huber, Arnulf
 Kameke, Allard von
 Voelker, Ingeborg
 Franck, Peter
 Both, Georg
 Heesch, Helmut van
 Gross, Ulrich-Maria
 Ahme, Johannes
 Muth, Heinz-Peter
 Manke, Lars
 Weber-Quitzau, Martin
 Menges, Albrecht von

UEXKÜLL & STOLBERG
 Beselerstr. 4,
 22607 Hamburg
 DE

Box No.V DESIGNATION OF STATES

The following designations are hereby made under Rule 4.9(a) (mark the applicable check-boxes; at least one must be marked):

Regional Patent

AP ARIPO Patent: GH Ghana, GM Gambia, KE Kenya, LS Lesotho, MW Malawi, SD Sudan, SL Sierra Leone, SZ Swaziland, UG Uganda, ZW Zimbabwe, and any other State which is a Contracting State of the Harare Protocol and of the PCT

EA Eurasian Patent: AM Armenia, AZ Azerbaijan, BY Belarus, KG Kyrgyzstan, KZ Kazakhstan, MD Republic of Moldova, RU Russian Federation, TJ Tajikistan, TM Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT

EP European Patent: AT Austria, BE Belgium, CH and LI Switzerland and Liechtenstein, CY Cyprus, DE Germany, DK Denmark, ES Spain, FI Finland, FR France, GB United Kingdom, GR Greece, IE Ireland, IT Italy, LU Luxembourg, MC Monaco, NL Netherlands, PT Portugal, SE Sweden, and any other State which is a Contracting State of the European Patent Convention and of the PCT

OA OAPI Patent: BF Burkina Faso, BJ Benin, CF Central African Republic, CG Congo, CI Côte d'Ivoire, CM Cameroon, GA Gabon, GN Guinea, GW Guinea-Bissau, ML Mali, MR Mauritania, NE Niger, SN Senegal, TD Chad, TG Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT (if other kind of protection or treatment desired, specify on dotted line)

National Patent (if other kind of protection or treatment desired, specify on dotted line):

<input checked="" type="checkbox"/> AE United Arab Emirates	<input checked="" type="checkbox"/> LR Liberia	
<input checked="" type="checkbox"/> AL Albania	<input checked="" type="checkbox"/> LS Lesotho	
<input checked="" type="checkbox"/> AM Armenia	<input checked="" type="checkbox"/> LT Lithuania	
<input checked="" type="checkbox"/> AT Austria	<input checked="" type="checkbox"/> LU Luxembourg	
<input checked="" type="checkbox"/> AU Australia	<input checked="" type="checkbox"/> LV Latvia	
<input checked="" type="checkbox"/> AZ Azerbaijan	<input checked="" type="checkbox"/> MD Republic of Moldova	
<input checked="" type="checkbox"/> BA Bosnia and Herzegovina	<input checked="" type="checkbox"/> MG Madagascar	
<input checked="" type="checkbox"/> BB Barbados	<input checked="" type="checkbox"/> MK The former Yugoslav Republic of Macedonia	
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(54) Title: BADGE-FREE CAN COATING

(57) Abstract

An exemplary coating of the invention, suitable for use as an interior coating for metal cans, comprises (a) a polyester resin; (b) a resin resin; and (c) a solvent, the coating being substantially free of bisphenol-A-diglycidyl-ether and bisphenol-F-diglycidyl ether (e.g., "BADGE" or "BADGE-type" components), and preferably also substantially free of polyvinyl chloride.

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BADGE-FREE CAN COATING

Background of the Invention

Metal containers for receiving foods and beverages generally have one or more coatings to prevent contact between the filled product and metal. This is to prevent or minimize corrosion to the metal by the product and any disadvantageous influences on the quality of the product. For producing containers of this type, such as steel or tin cans, metal sheets are used which, prior to their shaping (such as for three-piece can production) or deformation (such as for deep drawing process), are coated with suitable coating compositions. In producing cans for foods and beverages, coatings are required which are extremely flexible and have a low order of toxicity.

Epoxy phenolic type coatings have been applied as lacquers onto metal can stock (e.g., for three-piece cans) and baked to provide coatings having good resistance to aggressive filled products, mechanical performance and metal adhesion. However, many of these incorporate 2,2'-bis(4-hydroxyphenyl) propane-bis(2,3-epoxypropyl)-ether (or homologues thereof), otherwise known as bisphenol-A-diglycidyl-ether or "BADGE" (Bisphenol-A-DiGlycidyl-Ether).

One objective of the present invention is to provide a novel can coating which is substantially free of BADGE (and BADGE-type components). BADGE-containing formulations do not meet approval in some countries for use in food canning. Currently available polyester type coatings, such as those cross-linked with amino-type or isocyanate-type resins, are used on the exterior of three-piece cans, but do not resist processing when in contact with food, or do not comply with food laws, and therefore do not yet provide an alternative coating formulation. In view of the foregoing disadvantages of the prior art, a novel can coating is need which is substantially BADGE-free (and PVC-free as well).

Summary of the Invention

In surmounting the disadvantages of the prior art, the present invention provides a coating for metal sheet substrates, such as metal cans or metal can stock, which is substantially BADGE-free.

10 Another objective of the present invention to provide a coating which is substantially free of polyvinyl chloride (PVC).

15 A further objective of the invention is to provide metal can coatings that have suitable flexibility and are safe when processed in contact with food. The coatings should be suitable for three-piece cans as well as deep-drawn metal cans.

20 An exemplary coating of the invention comprises (a) a polyester resin (20-50% wt.); (b) a resol resin (1-15% wt.); and (c) a solvent component (35-79% wt.), all weight percentages based on total coating weight, the coating being substantially free of bisphenol-A-diglycidyl-ether and bisphenol-F-diglycidyl ether (e.g., "BADGE" or "BADGE-type" components), and 25 preferably also substantially free of polyvinyl chloride. In further preferred embodiments, the coating comprises a lubricant (0.1-2% wt.) and acid catalyst (0-2% wt.).

25 Further advantages and features of the present invention are discussed hereinafter.

Detailed Description of the Invention

All weight percentages provided herein are based on the total weight of the coating composition including solvent.

30 As summarized above, exemplary coating compositions of the invention comprise: (a) a polyester resin in the amount of 20-50% wt.; (b) a resol resin in the amount of 1-15% wt. and comprising a condensation product made from a phenol or homologue thereof and formaldehyde; and (c) a solvent in the amount of 35-79% wt., all weight percentages being based on 35 the total weight of said coating, the coating compositions being substantially

5 free of bisphenol-A-diglycidyl-ether ("BADGE") and bisphenol-F-diglycidyl ether (a "BADGE-type" component).

10 The phrase "substantially free" as used within the context of this application means that the coating compositions of the invention have no BADGE, BADGE-type component, or PVC, or at least no more than a de minimus amount of these components, e.g., less than 0.001% by total wt..

15 An exemplary polyester resin component of the invention comprises (a) trimethylolpropane in the amount of 0.1-10% wt. and more preferably 1-7% wt.; neopentylglycol in the amount of 15-30% wt. and more preferably 20-25% by wt.; at least one other polyol (e.g., ethylene glycol, propylene glycol) in the amount of 5-20% wt. and more preferably 10-15% wt.; phthalic acid (including iso- and tere-) in the amount of 20-60% wt. and more preferably 20-25% wt.; and adipic acid in the amount of 10-35% wt. and more preferably 15-20% wt. A commercially available polyester resin, available from DSM Resins of Zwolle, The Netherlands under the tradename URALAC XP 8481 SN, is believed to be suitable for use as polyester resin component (a) in the present invention.

20 Resol resin component (b) may be characterized as a condensation resin made from a phenol or phenolic homologue (phenol, butyl phenol, cresol, xylenol, Bisphenol A) and formaldehyde. Preferably, the resol resin comprises Bisphenol A, butyl phenol, xylenol, or a mixture thereof, and formaldehyde. Commercially available resol resins believed to be suitable for use in the present invention are available from Vianova Resins, Germany, under the tradename PHENODUR PR 401 and from Deutsche Shell Chemie, Germany, under the tradename EPICURE DX 200.

25 30 The resins can be solvated in a solvent or solvent mixture, for example, n-butanol and/or butylcellusolve, or other conventional solvents used for can coatings. The resin can be etherified with an alcohol (e.g., butanol) and solvated in the solvent or solvent mixture. Other known solvents that can be used for solvating the polyester and resol resins include aromatic hydrocarbons (e.g., aromatic 100 or aromatic 150), glycolether/glycolether

5 acetate (e.g., methoxypropanol butylcellusolveacetate, methoxypropylacetate,), alcohols (e.g., isobutanol, diacetone alkohol), ketons (e.g., methylisobutylketon, isophorone) or esters (e.g., butyl acetate, dibasic esters). In other exemplary coating compositions of the invention, at least two different solvents are used, preferably having different boiling ranges.

10 Preferably, the coating composition further comprises a lubricant which is in a solid form dispersed in solvent. The lubricant may be present in the coating composition in the amount of 0.1-2% wt., and more preferably 0.1-1% wt. Exemplary lubricants may comprise polyethylene (PE), polypropylene (PP), PTFE, lanoline, carnauba wax and petrolatum.
15 Preferably, the lubricant comprises PE, PP or PTFE or a mixture of these.

Preferred coating compositions also comprise at least one catalyst, preferably an acidic catalyst, such as sulfonic acid (e.g., paratoluene sulfonic acid and dodecyl benzenesulfonic acid), phosphoric acid and phosphoric acid ester (e.g., phosphoric acid monobutyl ester), in the amount of 0.05-2.0% wt., and more preferably in the amount of 0.05-1.0% wt.

20 Accordingly, a preferred coating composition of the invention comprises polyester resin (solid) (20-50% wt); resol resin (solid) (1-15% wt); a lubricant (solid) (0.1-2% wt); an acidic catalyst (0-2% wt); and a solvent (35-79% wt), all percentages based on the total weight of the coating composition.

25 The coating may be applied to a metal substrate or metal plate for a can, such as by roller coating or spray coating, or it may be applied by these means to a formed can. Preferred application is by roller coating to the flat metal before formation of the can. Preferred coating layer weights are 2-15 gsm (grams/square meter), and more preferably 3-8 gsm. After application, 30 the coating should be cured at 180°C - 210°C, and more preferably at 190°C - 205°C for 6 to 20 minutes, and more preferably 8-13 minutes.

Example 1

An exemplary can coating composition of the invention may be prepared and applied as follows. A coating batch may be formulated as follows, using a blender that can mix the following components into a sufficiently homogeneous composition. The polyester resin, comprising 10 trimethylolpropane, neopentylglycol, and other polyols, as previously discussed, is preferably added first into the blender in the amount of 40-85% wt and more preferably 69-80% wt (based total weight of coating composition). The polyester resin was URALAC XP 8481 SN (from DSM Resins) which was solvated in a solvent mixture that comprised SOLVESSO 15 150 and butyl cellosolve (which solvents were used in a 4:1 weight ratio). SOLVESSO 150 aromatic hydrocarbon solvent is available from Exxon Chemical, and is believed to have a boiling range of 186-210°C. Butyl cellosolve is otherwise known as butyl glycole (e.g., ethylene glycol mono butyl ether).

20 Thus, once the polyester resin is introduced into the blender, then the other components can be introduced thereafter during mixing, as follows:

Preferred Range % (total weight)	More Preferred Range % (total weight)	Component	Description of Component
40-85	60-80	Polyester Resin	URALAC XP 8481 (which is about 50% resin components in Solvesso 150/Butyl Cellosolve 4:1)
4-25 %	6-15 %	Resol Resin	PHENODUR PR 401, 70% in butanol
0-25 %	3-8 %	methoxy propyl acetate	optional additional solvent
0-25 %	3-8 %	butyl cellosolve acetate	optional additional solvent
0-25 %	3-10 %	aromatic hydrocarbon solvent	optional additional solvent (e.g., SOLVESSO 100 from Exxon)
0-5 %	0.5-2.0%	mixture of methoxy propanole and phosphoric acid	optional additional solvent wherein these components are preferably used 4:1
0.5-5.0 %	0.8-3.0 %	lubricant in solvent	lubricant such as PTFE (solid) can be used if solvated in solvents, e.g., SOLVESSO 100 and butyl cellosolve in 1:1:1 ratio

5 Exemplary lubricants which are suitable for use in the present invention are PTFE (polytetrafluoroethylene) modified with polyethylene wax, micronised (e.g., specially fine), and are available from Lanco Wax under the designations "TF 1780 EF." Also available from Lanco Wax is a polyethylene/polypropylene lubricant under the designation "PP 1350 FF" 10 which may also be suitable in the present invention. The lubricant, which is in solid form, should be mixed with a suitable solvent or solvents, such as SOLVESSO 100 (an hydrocarbon based solvent from Exxon) and butyl cellosolve, in amounts sufficient to prevent agglomeration of the lubricant in the mixture.

15 Once a homogeneous mixture of the coating components is obtained, this may be roller coated onto steel or aluminum can stock, for example, and baked at about 200°C for preferably 12-15 minutes. A BADGE-free can coating is thus obtained.

20 The foregoing discussion is provided by way of illustration only and is not intended to limit the scope of the invention as set forth in the claims.

Claims:

1. A coating composition for metal capable of being formed into a container, said coating composition comprising:
 - a) a polyester resin in the amount of 20-50% by wt.;
 - b) a resol resin in the amount of 1-15% by wt. and comprising a condensation product made from a phenol or homologue thereof and formaldehyde; and
 - c) a solvent component in the amount of 35-79% by wt., all foregoing weight percentages being based on the total weight of the coating composition; and

the coating composition being substantially free of bisphenol-A-diglycidyl ether, bisphenol-F-diglycidyl ether, homologues thereof, and polyvinyl chloride.
2. The coating composition of claim 1 further comprising at least one lubricant.
3. The coating composition of claim 2 wherein said lubricant comprises polyethylene, polypropylene, tetrafluor ethylene or a mixture of these.
4. The coating composition of any claims 1-3 wherein said polyester resin comprises trimethylolpropane in the amount of 0.1-10% by wt., neopentylglycol in the amount of 15-30% by wt., at least one other polyol in the amount of 5-20% by wt., a phthalic acid in the amount of 20-60% by wt., and adipic acid in the amount of 10-35% by wt.

5. The coating composition of any of claims 1-4 wherein said resol resin is a condensation product made from phenol, butyl phenol, cresol, xyleneol, bisphenol A, or a mixture thereof.
6. The coating composition of claim 5 wherein said resol resin comprises bisphenol A, butyl phenol, and xyleneol or a mixture thereof.
7. The coating composition of any of claims 1-6 wherein said solvent comprises an aromatic hydrocarbon, a glycolether/glycolether acetate, n-butanol, an aromatic hydrocarbon, a glycolether/glycolether acetate, an alcohol, an ester, or a mixture thereof.
8. The coating composition of any of claims 1-7 comprising: a polyester resin dispersed in a solvent (20-50% by wt.); a resol resin dissolved in a solvent (1-15% by wt.); a lubricant in solid form dispersed in at least one solvent (0.1-2% by wt.); an acidic catalyst (0-2% by wt.); and said solvent or solvents being operative to solvate said resins and lubricant, all percentages based on the total weight of the coating composition.
9. The coating composition of claim 8 wherein said polyester and said resol resin are combined together using at least two different solvents.
10. The coating composition of any of claims 1-9 wherein said coating is coated onto a metal substrate.

11. The coating composition of claim 1 wherein said polyester resin comprises trimethylolpropane and neopentylglycol; said resol resin comprises a condensation resin made from a phenol or phenolic homologue and formaldehyde; at least one lubricant comprising polyethylene, polypropylene, PTFE, lanoline, carnauba wax, petrolatum, or a mixture thereof; and at least two different solvents.
12. The coating composition of claim 11 wherein at least one of said two different solvents comprises an aromatic hydrocarbon type solvent.
13. The coating composition of any of claims 1-12 wherein said composition comprises at least two different solvents having different boiling ranges.
14. A coated metal substrate comprising a metal sheet having the coating composition of any of claims 1-13.
15. A coated can body having the coating composition according to any of claims 1-13.
16. The coating composition of claim 1 further comprising at least one catalyst.

AMENDED CLAIMS

[received by the International Bureau on 12 July 2000 (12.07.00);
original claims 1 and 6 replaced by amended claim 1; original claim 5 cancelled;
remaining claims renumbered accordingly (3 pages)]

1. A coating composition for metal capable of being formed into a container, said coating composition comprising:

- a polyester resin in the amount of 20-50% by wt.;
- a resol resin in the amount of 1-15% by wt. and comprising a condensation product made from bisphenol A, butyl phenol, xlenol or a mixture thereof and formaldehyde; and
- a solvent component in the amount of 35-79% by wt., all foregoing weight percentages being based on the total weight of the coating composition; and

the coating composition being substantially free of bisphenol-A-diglycidyl ether, bisphenol-F-diglycidyl ether, homologues thereof, and polyvinyl chloride.

2. The coating composition of claim 1 further comprising at least one lubricant.

3. The coating composition of claim 2 wherein said lubricant comprises polyethylene, polypropylene, tetrafluor ethylene or a mixture of these.

4. The coating composition of any of claims 1-3 wherein said polyester resin comprises trimethylolpropane in the amount of 0.1-10% by wt., neopentylglycol in the amount of 15-30% by wt., at least one other polyol in the amount of 5-20% by wt., a phthalic acid in the amount of 20-60% by wt., and adipic acid in the amount of 10-35% by wt.

5. The coating composition of any of claims 1-4 wherein said solvent comprises an aromatic hydrocarbon, a glycolether/glycolether acetate, n-butanol, an aromatic hydrocarbon, a glycolether/glycolether acetate, an alcohol, an ester, or a mixture thereof.

6. The coating composition of any of claims 1-5 comprising: a polyester resin dispersed in a solvent (2-50% by wt.); a resol resin dissolved in a solvent (1-15% by wt.); a lubricant in solid form dispersed in at least one solvent (0.1-2% by wt.); an acidic catalyst (0-2% by wt.); and said solvent or solvents being operative to solvate said resins and lubricant; all percentages based on the total weight of the coating composition.

7. The coating compositions of claim 6 wherein said polyester and said resol resin are combined together using at least two different solvents.

8. The coating composition of any of claims 1-7 wherein said coating is coated onto a metal substrate.

9. The coating composition of claim 1 wherein said polyester resin comprises trimethylolpropane and neopentylglycol; said resol resin comprises a condensation resin made from bisphenol A, butyl phenol, xylanol or a mixture thereof and formaldehyde; at least one lubricant comprising polyethylene, polypropylene, PTFE, lanoline, carnauba wax, petrolatum, or a mixture thereof; and at least two different solvents.

10. The coating composition of claim 9 wherein at least one of the said two different solvents comprises an aromatic hydrocarbon type solvent.

11. The coating composition of any of claims 1-10 wherein said composition comprises at least two different solvents having different boiling ranges.
12. A coated metal substrate comprising a metal sheet having the coating composition of any of claims 1-11.
13. A coated can body having the coating composition according to any of claims 1-11.
14. The coating composition of claim 1 further comprising at least one catalyst.

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP 00/01065

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 C09D167/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 C09D C08L B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
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C. DOCUMENTS CONSIDERED TO BE RELEVANT
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Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 40 10 167 A (BASF LACKE & FARBEN) 2 October 1991 (1991-10-02) page 2, paragraphs 1,2; claims 1,2,10,11 page 3, line 36 - line 51 page 3, line 59 - line 67 page 4, line 46 - line 49 page 5, paragraphs 1,3-5 examples 2,24	1-3,5, 7-16
X	GB 964 440 A (SCHENECTADY CHEMICALS INC.) page 1, column 1, paragraph 3; claim 10 page 1, column 2, line 62 - line 70 page 2, column 2, paragraph 1 examples 7-14	1,10,14, 15
		-/-

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
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- "P" document published prior to the international filing date but later than the priority date claimed

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Date of the actual completion of the international search	Date of mailing of the international search report
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9 May 2000	19/05/2000
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Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Authorized officer
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Lauteschlaeger, S

INTERNATIONAL SEARCH REPORT

Int. Appl. Application No

PCT/EP 00/01065

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 22 28 288 A (STOLLACK AG) 28 December 1972 (1972-12-28) example 5 page 2, paragraphs 1,2	1,10,14, 15
X	GB 349 464 A (IMPERIAL CHEMICAL INDUSTRIES LIMITED) claim 2; examples 1-3	1,9,16
X	GB 1 119 091 A (SCHEECTADY CHEMICALS INC.) page 1, column 1, paragraph 2; claim 1 page 2, column 1, paragraphs 2,4-6	1,5-7,10
X	GB 836 004 A (SCHEECTADY VARNISH COMP.) page 2, column 1, paragraphs 3,4; claims 7,12,32	1,10

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP 00/01065

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		DD	97438 A	05-05-1973
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